

# PATENT ABSTRACTS OF JAPAN

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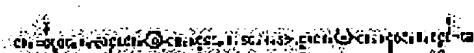
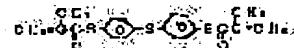
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## (54) URETHANE-CONTAINING HIGH REFRACTIVE INDEX LENS

### (57)Abstract:

**PURPOSE:** To provide a plastic ophthalmic lens produced from a lightweight plastic stock having a high refractive index and small chromatic aberration, that is, a large Abbe's number.

**CONSTITUTION:** This urethane-contg. high refractive index ophthalmic lens having a large Abbe's number is obtd. by radical-polymerizing 30-70 pts.wt. methacrylic thio-ester represented by formula I and 10-60 pts.wt. sulfur-contg. urethane acrylate (methacrylate) represented by formula II in the presence of 8-30 pts.wt. arom. vinyl compd. In the formula II, X is H or CH<sub>3</sub> and (n) is an integer of 1-5.



II

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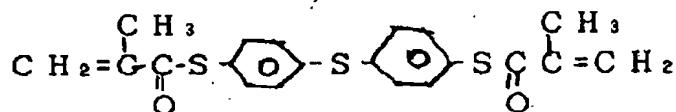
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## CLAIMS

## [Claim(s)]

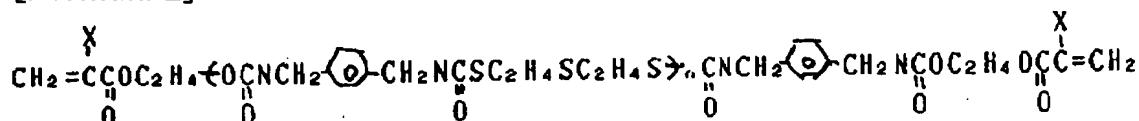
[Claim 1] The urethane system quantity refractive-index spectacle lens characterized by having a refractive index with it. [ the large Abbe number obtained by carrying out the radical polymerization of the methacrylic thioester 30 shown by the following-ization 1 (structure expression 1) - 70 weight sections, and the sulfur-containing urethane acrylic (methacrylic) ester 10 shown by the following-ization 2 (structure expression 2) - 60 weight sections to the bottom of existence of the aromatic series vinyl compound 8 - 30 weight sections, and ] [ high ]

## [Formula 1]



構造式 1

## [Formula 2]



構造式 2

ここで X は、H または C H<sub>3</sub>を示す。  
n は、1 ~ 5 の整数を示す。

[Translation done.]

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** This invention relates to the manufacture approach of a spectacle lens. Furthermore, when it states in detail, the Abbe number which uses a specific sulfur compound and specific sulfur-containing urethane acrylic (methacrylic) ester as a principal component is related with the manufacture approach of a spectacle lens of having a large, high refractive index.

**[0002]**

**[Description of the Prior Art]** The need of a spectacle lens is changing from glass to plastics quickly. It is light and this reason is because [ which does not have plastics in glass ] it has the safe property that reinforcement is large. However, generally, the refractive index of plastics is low compared with glass, and since the spectacle lens made from plastics of an advanced number becomes thick especially, a plastics material of a spectacle lens is wanted for there to be with a high refractive index. In order to make a plastics material into a high refractive index, the approach of generally using the material containing many aromatic series radicals and the approach of using the compound containing many chlorine or bromine atoms are learned. However, the former approach causes chromatic aberration, the latter becomes heavy by including many chlorine and bromine atoms, and it becomes difficult to attain the lightness which is the description of a plastics material. It is a plastics material from this semantics, and it is lightweight at a high refractive index, and the spectacle lens made from plastics manufactured from the ingredient with the large Abbe number small [ chromatic aberration ] is called for.

**[0003]**

**[Problem(s) to be Solved by the Invention]** This invention is offering the spectacle lens made from plastics which it was a plastics material, was lightweight at the high refractive index, and was manufactured from the ingredient with the large Abbe number small [ chromatic aberration ] according to the above present condition.

**[0004]**

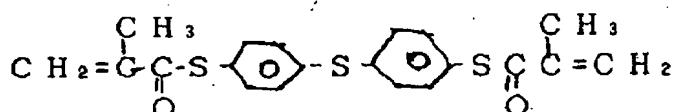
**[Means for Solving the Problem]** This invention is obtained by carrying out the radical polymerization of an aromatic series radical, the specific JIMETA krill compound containing a sulfur atom, and the sulfur-containing urethane acrylic (methacrylic) ester compound of specific structure to the bottom of existence of

an aromatic series vinyl compound, in order to make coincidence attain a high refractive index and the high Abbe number. It came to offer the spectacle lens made from plastics which was a plastics material, was lightweight at the high refractive index and was manufactured from the ingredient with the large Abbe number small [ chromatic aberration ] by such approach.

[0005] Hereafter, this invention is explained in full detail. Even if three components of this invention are bearing each role and it lacks one anything, it is lightweight at the high refractive index of this invention, and it is impossible to make the spectacle lens made from plastics manufactured from the ingredient with the large Abbe number small [ chromatic aberration ]. First, the JIMETA krill thioester which has the sulfur atom shown by the following-ization 3 (structure expression 1) is a principal component indispensable to a raise in a refractive index in the spectacle lens ingredient of this invention by including many sulfur atoms and aromatic series radicals. However, by using the urethane acrylic (methacrylic) ester compound further shown in this invention by \*\* 4 (structure expression 2) containing a fat group sulfur compound in the high refractive index of the compound of a structure expression 1, and the description of the high Abbe number as an indispensable component, a sulfur content tends to be raised further and it is going to obtain the high Abbe number.

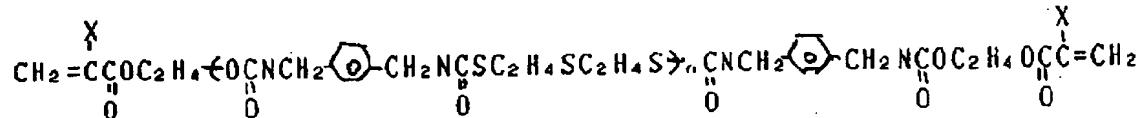
[0006]

[Formula 3]



構造式 1

[Formula 4]



構造式 2

ここで X は、H または  $\text{C}_2\text{H}_5$  を示す。  
n は、1 ~ 5 の整数を示す。

[0007] Here, in order that the reason using the urethane acrylic (methacrylic) ester compound shown with a structure expression 2 as an indispensable component may raise a sulfur content as much as possible and may raise the Abbe number, it is for making monomer viscosity easy to control to the viscosity suitable for a casting polymerization compared with the case of only the JIMETA krill thioester which has the sulfur atom shown with a structure expression 1. The urethane acrylic (methacrylic) ester compound shown with a structure expression 2 can be obtained by performing an urethane-ized reaction by the stoichiometry aiming at hydroxyethyl acrylate (methacrylate), CHIOJI (mercapto ethyl), and meta-xylylene diisocyanate. That is, it can attain by choosing the presentation which makes [ many ] the value of n of a structure expression 2 to make a sulfur content high.

However, the bridge formation effectiveness of resin becomes weak in this case. In this invention, the value of this n is important and n is chosen from the integer of 1-5. Although it becomes effective in order to be able to make a sulfur content high and to raise a high refractive index and the Abbe number when n exceeds 5, the bridge formation effectiveness of resin does not serve as a weak heat-resistant useful high glasses ingredient. For this reason, in this invention, as for the value of n in the urethane acrylic (methacrylic) ester compound shown with a structure expression 2, the range of n=1-5 is used preferably.

[0008] In this invention, the urethane acrylic (methacrylic) ester compound shown with a structure expression 2 The hydroxyethyl acrylate of the stoichiometry made into the purpose at the compound and the aromatic series vinyl compound mentioned later of a structure expression 1 (methacrylate), CHIOJI (mercapto ethyl) and meta-xylylene diisocyanate -- mixing -- urethane-ized catalysts, such as a tin system compound usual to this, -- mixing -- warming -- the bottom -- or An urethane-ized reaction can be made to be able to perform to the bottom of a room temperature, and the urethane acrylic (methacrylic) ester shown with a structure expression 2 can be made to compound.

[0009] Furthermore, in this invention, an aromatic series vinyl compound is used as the third component. The reason using an aromatic series vinyl compound is because the viscosity of a lens monomer can be comparatively adjusted to arbitration by adding the aromatic series vinyl compound which is a liquid with low viscosity to the mixture of a structure expression 1 and structure-expression 2\*\* in order to make the lens of this invention lightweight-ize. As an example of the aromatic series vinyl compound used by this invention, it is styrene, alpha methyl styrene Divinylbenzene KURORU styrene and 4- Methoxy styrene, trivinylbenzene Although bromostyrene, KURORU methyl styrene, etc. can mention as a typical thing, these are examples and this invention is not limited only to these.

[0010] Thus, although three kinds of specific compounds which have each role are used as an indispensable component by this invention, as for that rate, it has a limit naturally, namely, the methacrylic thioester 30 shown with a structure expression 1 - 70 weight sections, and the urethane acrylic (methacrylic) ester 10 shown with a structure expression 2 - 60 weight sections -- and -- The presentation of the aromatic series vinyl compound 8 - 30 weight sections is used by this invention. Unless the methacrylic thioester shown with a structure expression 1 fulfills 30 weight sections, it cannot consider as the target lens of a high refractive index. If used exceeding 70 weight sections, the specific sulfur compound shown with a structure expression 2 and the content of CHIOJI (mercapto ethyl) will become small relatively, and the Abbe number will not become large. Next, if the urethane acrylic (methacrylic) ester compound shown with a structure expression 2 does not fulfill 10 weight sections, it cannot consider as the lens of the high Abbe number made into the purpose, and only a heat-resistant low lens with the weak bridge formation effectiveness will be obtained. Moreover, if used exceeding 60 weight sections, it cannot consider as the lens of a high refractive index. If 8 weight sections are not filled with an aromatic series vinyl compound, monomer viscosity tends to become large and it becomes impossible to control it to the viscosity suitable for a casting polymerization. Conversely, if used

exceeding 30 weight sections, monomer viscosity will become small, and it becomes impossible moreover, to control to the viscosity to which this was also suitable for the casting polymerization. Moreover, it will become the lens of the small Abbe number with a low refractive index. From this semantics, it is shown by the methacrylic thioester 30 shown with a structure expression 1 – 70 weight sections, and the structure expression 2 by this invention. It is used as range where the presentation of the urethane acrylic (methacrylic) ester compound 10 – 60 weight sections, and the aromatic series vinyl compound 8 – 30 weight sections is desirable.

[0011] Next, in this invention, three kinds of above compounds are mixed in the specific presentation range, and monomer viscosity can be made into the viscosity suitable for a moderate casting polymerization. In this invention, this monomer turns into a monomer for lenses for the first time. After an ultraviolet ray absorbent and other additives are added to this, a radical polymerization initiator is added. In this invention, there is especially no limitation of a radical polymerization initiator, and it can use the initiator used for the usual radical polymerization of arbitration. The amount of initiators is usually used as an amount with desirable per monomer 100 weight section and 0.3 – 5.0 weight section. Next, when the monomer containing the radical polymerization initiator of optimum dose is poured into glass mold and usually carries out a temperature up, a polymerization can be started and it can consider as a lens. This process is not special and is not replaced with the production approach of the usual plastic lens at all. As for polymerization temperature, the range of about 150 degrees is used abundantly from a room temperature. Thus, although the spectacle lens of the target diopter is producible, it is [ 1.60 or more ] more desirable [ the refractive index of the lens of this invention ] preferably that it is 1.62 or more. Moreover, as for the Abbe number, it is [ 25 or more ] more desirable preferably that it is 27 or more. Hereafter, an example explains this invention.

[0012] Example (1)

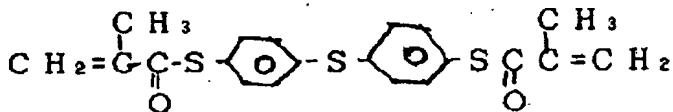
JIMETA krill thioester shown by the following – ization 5 (structure expression 1) 40 weight sections 2 – Hydroxyethyl methacrylate 7.06 Weight section Meta key silylene diisocyanate 20.4 Weight section CHIOJI (mercapto ethyl) 12.54 Weight section Styrene 10 Weight section Divinylbenzene (80% purity) 10 The weight section is mixed well and it is lauric-acid G to this. n – The butyl tin 0.02 weight section was added and the urethane – ized reaction was performed at 60 degrees C for 3 hours. The monomer viscosity at this time was 80cp at 25 degrees C. (Theoretically, the value of n shown with a structure expression 2 shows 3 on an average.) The benzoyl peroxide 1.1 weight section was added to this, and it mixed still better. It poured in into the mold of two sheets from which the glass curvature which supported the monomer of this presentation with the gasket differs, and temperature was applied to this and the radical polymerization was performed to it. the applied temperature -- 60 degrees C 24-hour 80 degrees C 5-hour 90 degrees C 5 hours it is .

Thus, the concave lens of -3.00 diopter was obtained by the main thickness of 1.5mm. This lens was transparent and colorless and visible-ray permeability was 90%. The property of this lens is shown below.

Refractive index 1.626 Abbe numbers 32 consistencies 1.27 g/cm<sup>3</sup> and this lens deforming into 130 degrees C and silicon system rebound ace court processing of not an hour at all, but excelling in thermal resistance was shown.

[0013]

[Formula 5]



構造式 1

[0014] Example (2)

The JIMETA krill thioester shown with the structure expression 1 used in the example (1) 50 Weight section 2 – Hydroxyethyl methacrylate 11.52 Weight section Meta key silylene diisocyanate 16.66 Weight section CHIOJI (mercapto ethyl) 6.82 Weight section Divinylbenzene (80% purity) 10 Weight section alpha methyl styrene 5 The weight section is mixed well and it is lauric-acid G to this. n – The butyl tin 0.02 weight section was added and the urethane-ized reaction was performed at 60 degrees C for 3 hours. The monomer viscosity at this time was 67cp at 25 degrees C. (Theoretically, the value of n shown with a structure expression 2 shows 1 on an average.) The benzoyl peroxide 1.1 weight section was added to this monomer solution, and it mixed still better. The convex lens of +1.25 diopter was obtained with the polymerization method according to an example (1). This lens was transparent and colorless and visible-ray permeability was 91%. The property of this lens is shown below.

Refractive index 1.632 Abbe numbers 28 consistencies 1.24 g/cm<sup>3</sup> and this lens deforming into 130 degrees C and silicon system rebound ace court processing of not an hour at all, but excelling in thermal resistance was shown.

[0014]

[Effect of the Invention] By the above approach, this invention was a plastics material by adopting the presentation of three kinds of specific specific range, was lightweight at the high refractive index, and made it possible to offer the spectacle lens made from plastics manufactured from the ingredient with the large Abbe number small [ chromatic aberration ].

[Translation done.]